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Brief Summary Text - BSTX (14):

A two-dimensional array can indicate a value for each pixel of an image or for each item in another body of data. In an array defining an image, for example, the technique can compare the threshold with each pixel's distance to a near neighbor that meets a reference criterion, such as ON or OFF. In clustering, the technique can set a pixel ON if its distance is below the threshold. In segmentation, the technique can set a pixel ON if its distance is above the threshold.

Brief Summary Text - BSTX (18):

To group parts of an image, as in clustering or segmentation, the technique can obtain the gap data from data defining the image. For example, the gap data can indicate, for each pixel, a distance to a black pixel that is a near neighbor of the pixel. The threshold can be compared with each pixel's distance to obtain a thresholded version of the image; each pixel with a distance above the threshold can be ON, or, alternatively, each pixel with a distance below the threshold can be ON. The technique can obtain the grouping data by labeling each pixel in a part of the image with a unique identifier of the group in the thresholded version that includes the part.

Brief Summary Text - BSTX (23):

The third approach can be applied in many ways. For initial array data defining an image, in which each item is a pixel value, clustering and segmentation can be performed as follows:

Brief Summary Text - BSTX (24):

To cluster, the gap data can indicate distance to a near neighbor for each



5537491A

Number: 5,537,491

Pub. No. Jul. 14, 1998

Issued by the U.S. Patent and Trademark Office, Department of Commerce, Washington, D.C. 20530-0001.

U.S. Patent 5,537,491 A, issued July 14, 1998, to the inventor, David L. Dineen, by the assignor, International Business Machines Corporation, Armonk, N.Y. 10504-1700.

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Full

To perform segmentation of partially bounded regions as in FIG. 13, the gap data can be obtained by applying an opposing foreground neighbor border criterion that requires a pixel that is on a border between parts of the input image in which pixels have near neighbors in the foreground that are approximately 180.degree. apart. The criterion can be applied by using input image 410 to obtain a direction data image in which each pixel is labeled with a direction to a near neighbor, then using the direction data image to obtain a direction difference data image, and then comparing each pixel's value in the direction difference data image with a criterion angle, such as 140 degrees, to obtain a large angle data image in which each pixel is ON if its value in the direction difference data image is greater than the criterion angle.



Furthermore, another benefit of substantially reducing the total `cluster` count by `merging` singletons is that algorithms used to find equivalence classes, such as the `eclazz()` algorithm previously discussed, can be applied to further improve `clustering` in accordance with the invention. More particularly, smaller `cluster` counts facilitate the use of a quadratic

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Further, in accordance with the understanding, the negotiators shall endeavor to expand capacity to the final group from the first stage chemistry. For example, in F10, 24% equivalence classes 220 resulted in a trial, consisting of 50 control and 50 stimulus cases out of 115.

The final clustering stage in the initial clustering was followed by a third K-M step to capture a conventional hierarchical clustering history as "single-linkage" clustering which was incorporated later when compared by Euclidean distances. The third stage was automatically derived using the images realizing that the second stage clustering of individual targets being correlated in a third phase grid intuitively, or the practical embodiment of the technique.

1. Histogram: This is a summation of the vertical and horizontal projection profiles taken on four half frames. The image line is first divided into upper and lower

number of black people in each country is estimated for each finishing, the groups are divided into high and low, and the average percentage black is obtained from each. These two groups are then correlated with each other with 54 countries (A. J. 1964), with each country being in longer in the range (A. J. 1964). The diagram shows water is further described in T. K. Sh et al, "Water Matter", in Proceedings of the 3rd International Conference on Document Analysis and Recognition, III, 777-781.

2. Measure the corner distances on drawings from each of the four edges of the bounding box to the element's center as follows: For each element, a distance is indicated from the upper edge of the box to the first black pixel of the element, and from the lower edge to the last black pixel. Similarly for each row, a distance is indicated from the left edge to the leftmost black pixel, and from the

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Figure 3A
(Object-to-Background
Contrast: Positive)

Figure 3B
(Object-to-Background
Contrast: Negative)

Figure 3C
(Object-to-Background
Contrast: Enhanced)

Brief Summary Text - BSTX (9):
Though the segmentation techniques described above are useful in isolating features of simple objects, they are often of only limited value in identifying objects with complex backgrounds. This typically arises in defect detection, that is, in segmenting images to identify defects on visually complicated surfaces, such as the surface of a semiconductor die, a printed circuit board, and printed materials. In these instances, segmentation is used to isolate a defect (if any) on these complex surfaces. If the surface has no defects, segmentation should reveal no object and only background. Otherwise, it should reveal the defect in the image as clusters of 1's against a background 0's.

Current US Cross Reference Classification -

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Figure 3D
(Background Only)

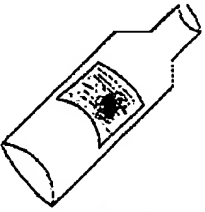


Figure 3E
(Object + Background)

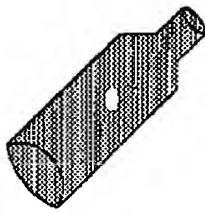


Figure 3F
(Object-to-Background
Contrast: High)

Brief Summary Text - BSTX (9):
Though the segmentation techniques described above are useful in isolating features of simple objects, they are often of only limited value in identifying objects with complex backgrounds. This typically arises in defect detection, that is, in segmenting images to identify defects on visually complicated surfaces, such as the surface of a semiconductor die, a printed circuit board, and printed materials. In these instances, segmentation is used to isolate a defect (if any) on these complex surfaces. If the surface has no defects, segmentation should reveal no object and only background. Otherwise, it should reveal the defect in the image as clusters of 1's against a background 0's.

Current US Cross Reference Classification -

Detail Test Image HTML KWIC

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Each matrix is then subjected to certain operations for compression. In MJPEG, each image frame is compressed using the standard JPEG compression technique. In JPEG, the first step is to perform a "discrete cosine transform," or DCT. In effect, the DCT changes the image space for the matrix, so that a vector related to the average luminance of all of the pixels in the block is made into an axis of the space. Following the DCT, the coefficients in the original matrix still completely describe the original image data, but larger value coefficients tend to cluster at the top left corner of the matrix, in a low spatial frequency region. Simultaneously, the coefficient values toward the lower right hand portion of the matrix will tend toward zero for most blocks in an image frame in an image sequence.

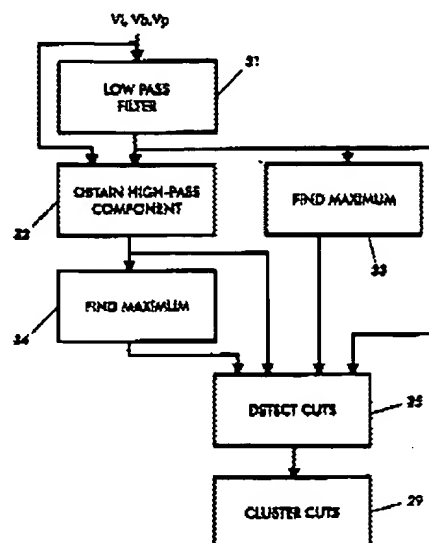


FIG. 11

U.S. PatentJan. 8, 2023Sheet 3 of 3US 6,337,917 B1

objects by clustering the estimated motion vectors. The boundaries of the objects found by these methods may be inadequate in some applications either due to utilization of block based motion estimates, or as a consequence of the the occlusions which are not taken care of. Usually, these motion vectors are estimated from the given image sequence but the resultant vectors may be erroneous. If segmentation is based on clustering of these possibly erroneous motion vectors, it is inevitable to obtain incorrect object boundaries. The proposed method, on the other hand, achieves the detection of objects by utilizing not only the motion vectors, but also the color information and the previous segmentation result. Another difference of the described method compared to those prior methods is the ability to achieve the detection and the tracking of objects simultaneously.

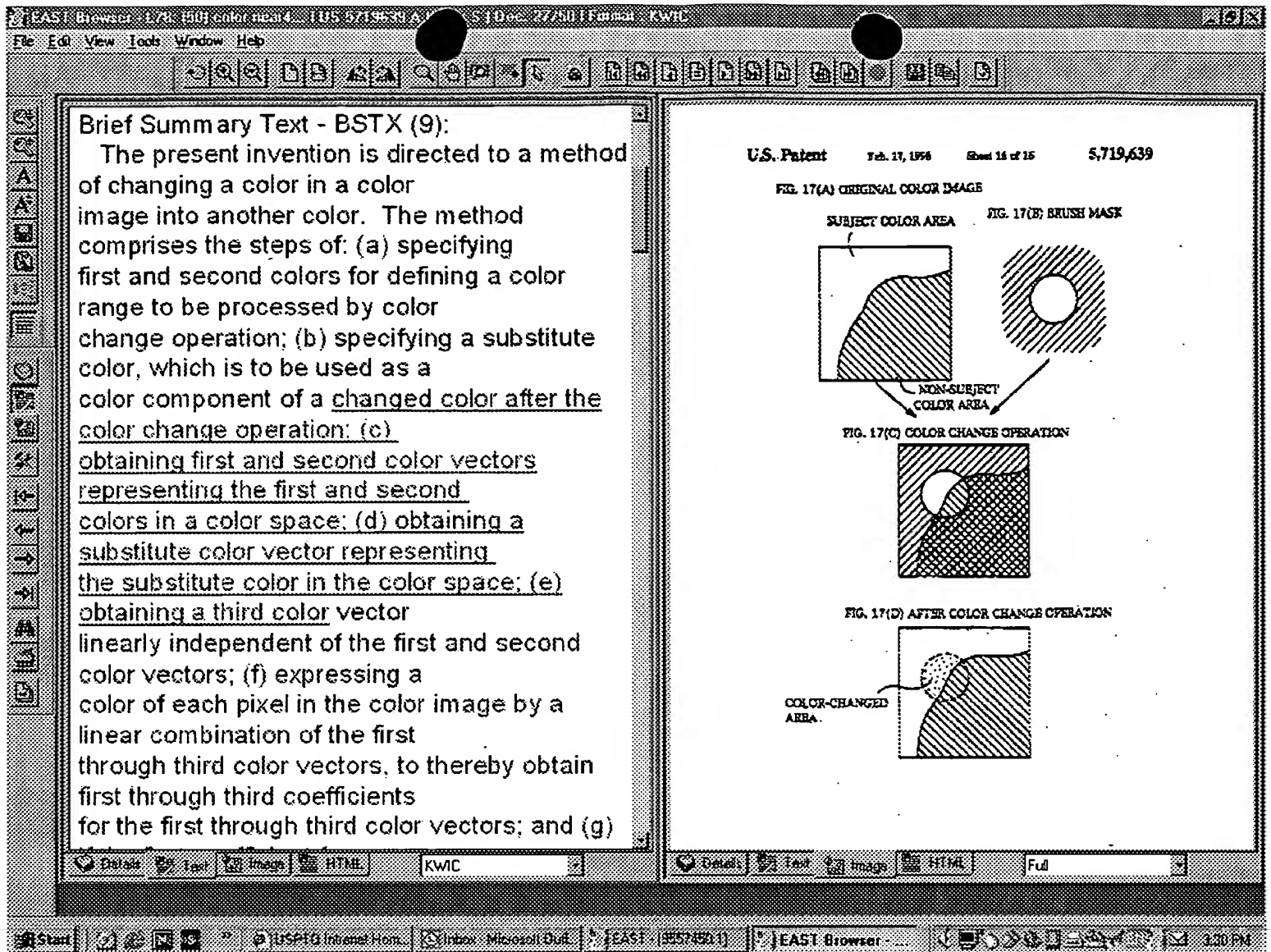
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Color Segmentation Mask: R^I
Motion Segmentation Mask: R^M
 $R^I \rightarrow R^M$ Projection
Resultant Segmentation Mask

Figure 3

DetailsTestImageHTMLKWICFull

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Close

request for a color image to facilitate the color characterization of a self-illuminating imaging device associated with the browser, forward the embedded response to a web browser, and generate a profile characterizing the self-illuminating imaging device using the color characterization program. The system is further configured to modify a response to a subsequent browser based request for a color image by replacing the image tags associated with the color image with substitute image tags configured to effect a color transformation based upon the profile characterizing the self-illuminating imaging device, forward the modified response to the web browser, and transform the color image based upon the substitute image tags for display on the self-illuminating imaging device.

Brief Summary Text - BSTX (18):
The system is further configured to modify

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graph LR
    subgraph Workstation [WORKSTATION 16]
        Browser[BROWSER SOFTWARE 18]
    end
    subgraph System [SYSTEM SOFTWARE 12]
        Browser
    end
    subgraph Server [WEB SERVER 14]
        Browser
    end
    subgraph Transformation [COLOR TRANSFORMATION APPLIED 28]
        Browser
    end
    subgraph ImageTags [IMAGE TAGS REPLACED 26]
        Browser
    end

    Browser -- Request --> System
    System -- Response --> Server
    System -- Modified Response --> Browser
    System -- Response --> ImageTags
    ImageTags --> Transformation
  
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FIG. 2

Color Blind

EAST Browser - 12/01/17/online.htm - US 6307961 B1 - Dec 1/7/17/online.htm - KWIC

File Edit View Tools Window Help

US-PAT-NO: 6307961

DOCUMENT-IDENTIFIER: US 6307961 B1

TITLE: User-interactive corrective tuning of color profiles

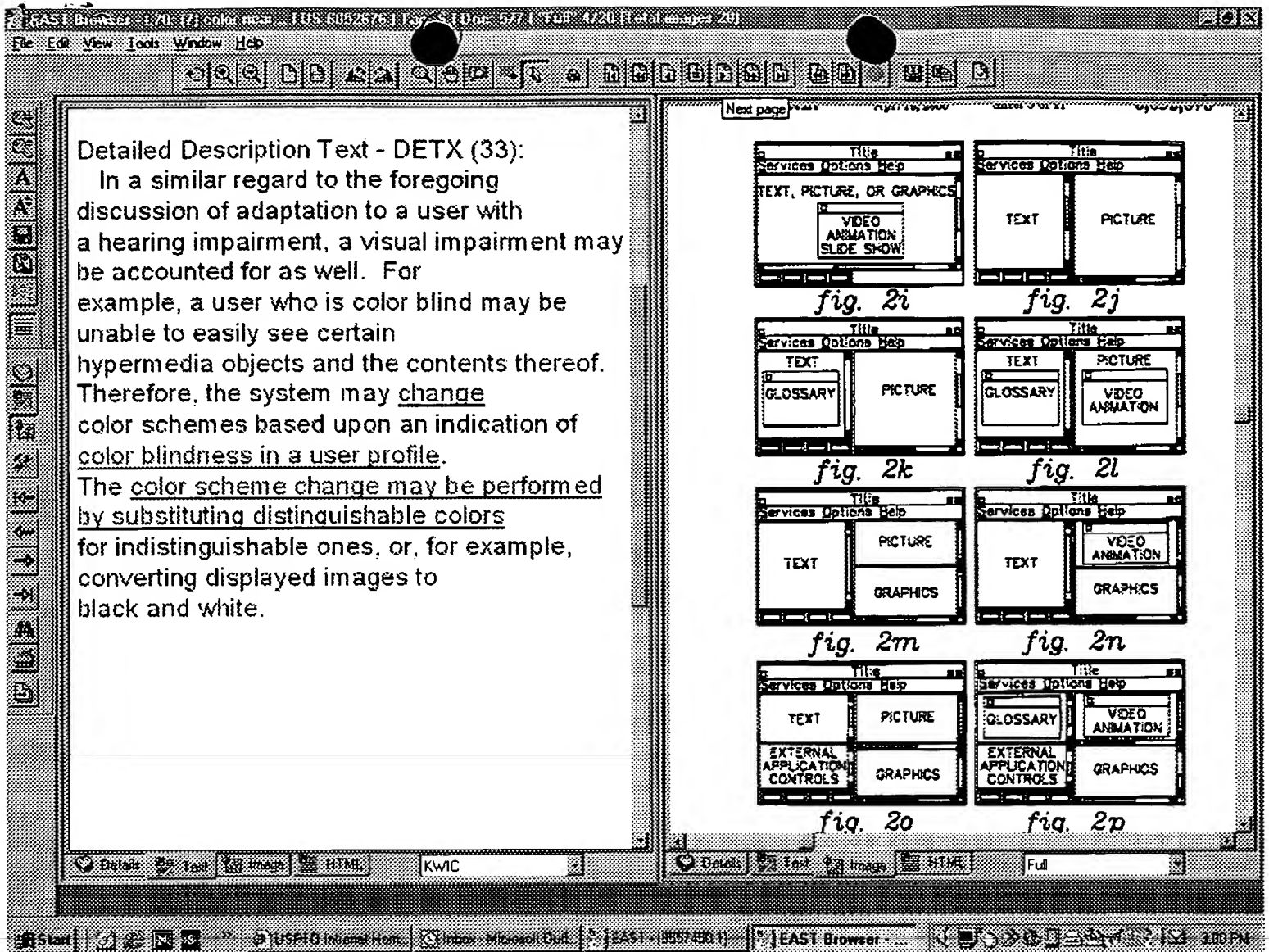
----- KWIC -----

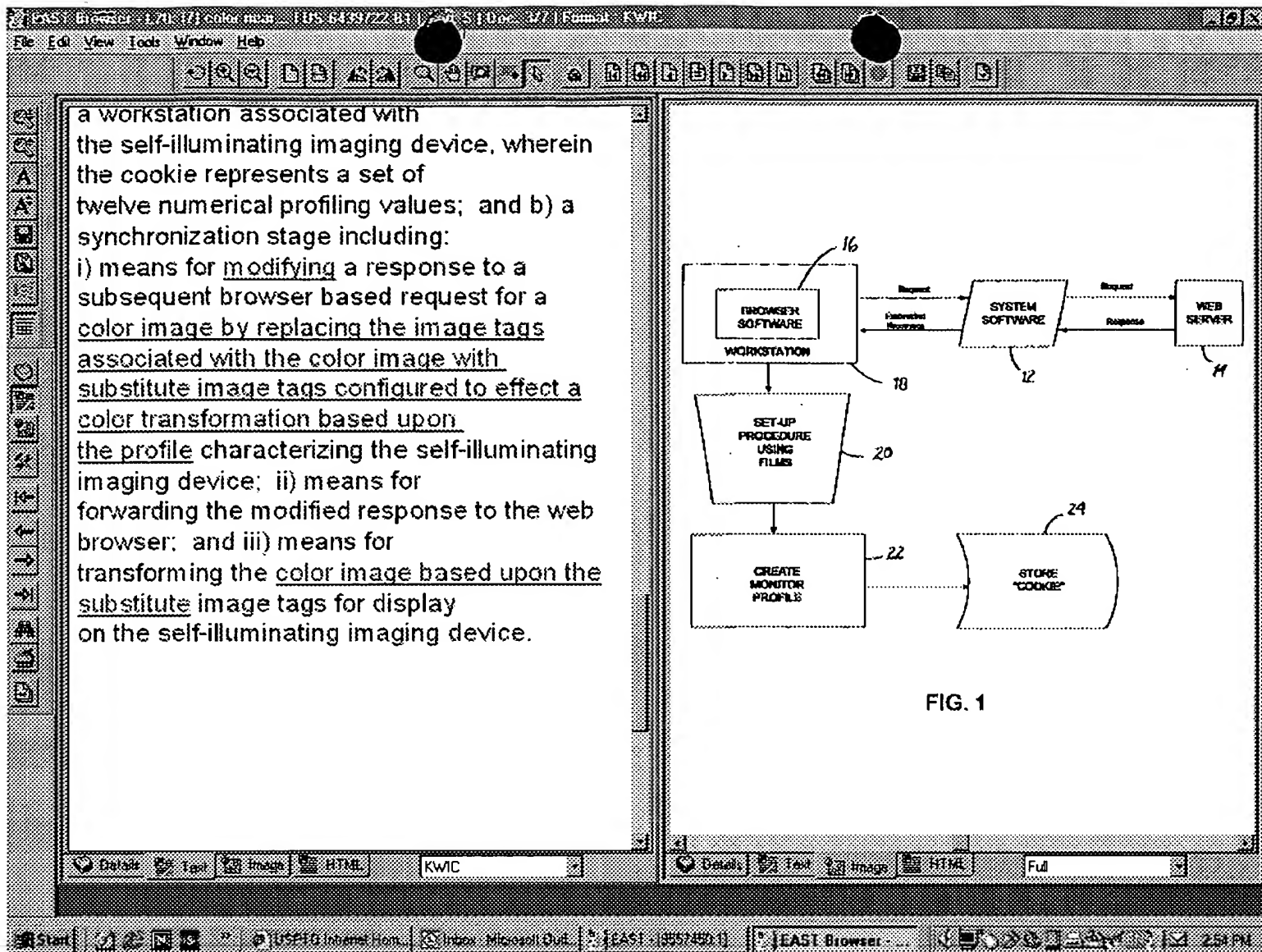
Claims Text - CLTX (16):
editing said color profile by replacing existing color tag information with said modifications.

FIG. 2

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graph TD
    FIRD[FIRST IMAGE RENDERING DEVICE] --> GCM[GENERATE COLOR MATCH]
    SIRD[SECOND IMAGE RENDERING DEVICE] --> GCM
    GCM --> UCPR[USE COLOR PROFILE TO RENDER SECOND IMAGE]
    UCPR --> ISOR[IDENTIFY SUB-OPTIMAL RENDERING OF COLOR]
    ISOR --> SPCR[SPECIFY PREFERRED COLOR RENDERING]
    SPCR --> AJF[ADJUST FIELDS AND TAGS OF PROFILE USING A PROPOGATION REGION]
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Start | [Icons] | [USP10 Internet Home] | [Inbox - Microsoft Outl.] | [EAST - 3557453.1] | [EAST Browser] | [2:57 PM]





Close

U.S. Patent May 14, 1998 Sheet 2 of 24 5,416,890

Detailed Description Text - DETX (173):

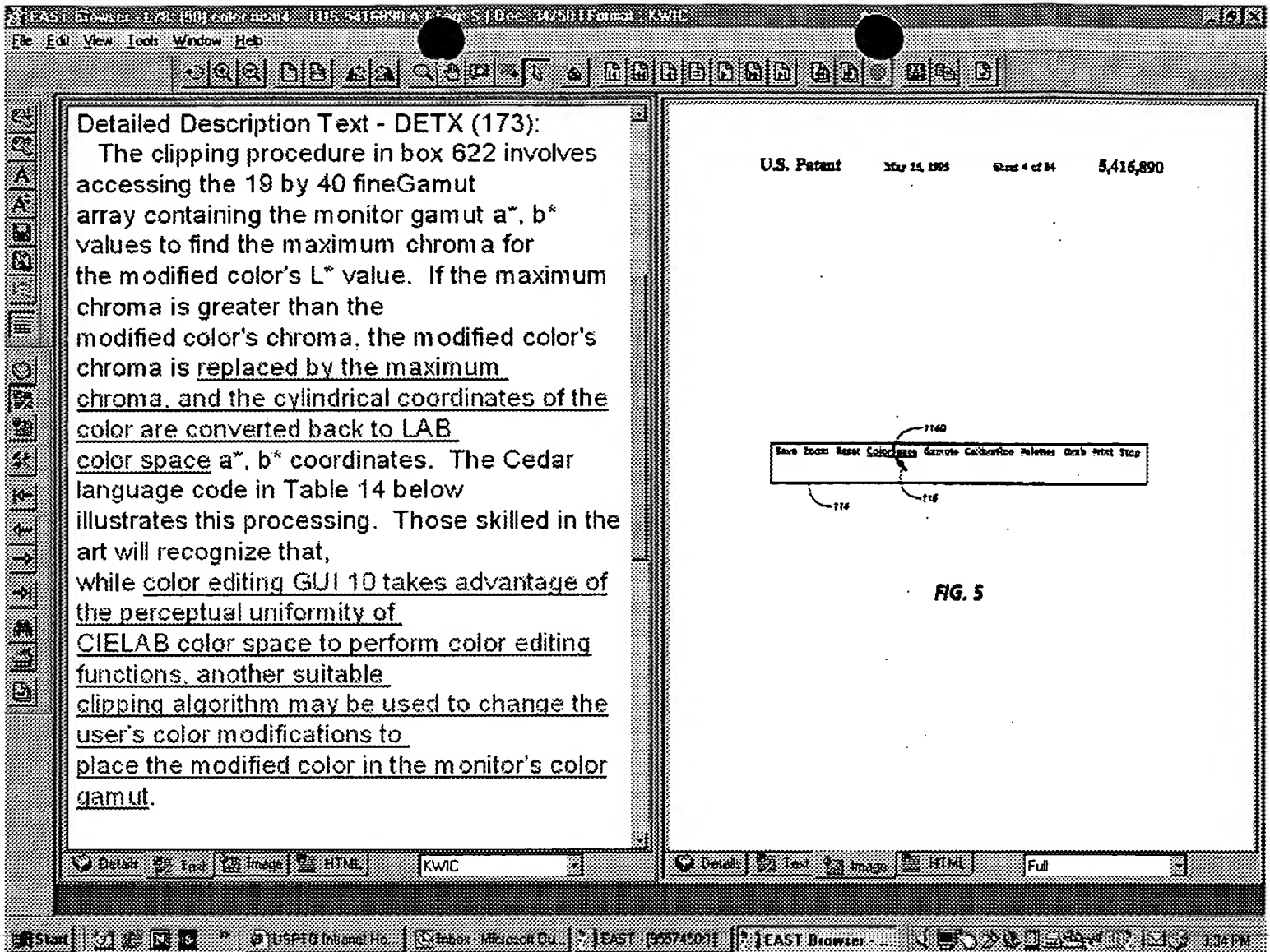
The clipping procedure in box 622 involves accessing the 19 by 40 fineGamut array containing the monitor gamut a^* , b^* values to find the maximum chroma for the modified color's L^* value. If the maximum chroma is greater than the modified color's chroma, the modified color's chroma is replaced by the maximum chroma, and the cylindrical coordinates of the color are converted back to LAB color space a^* , b^* coordinates. The Cedar language code in Table 14 below illustrates this processing. Those skilled in the art will recognize that, while color editing GUI 10 takes advantage of the perceptual uniformity of CIELAB color space to perform color editing functions, another suitable clipping algorithm may be used to change the user's color modifications to place the modified color in the monitor's color gamut.

```
graph TD
    20[USER INPUT MEANS] --> 17[Text Handler Optional]
    17 --> 16[I/O INTERFACE]
    16 <--> 14[INTERACTION HANDLER]
    14 <--> 12[COLOR EDITING CLIENT]
    16 --> 18[Graphics Software Optional]
    18 --> 30[DISPLAY MEANS]
```

FIG. 3

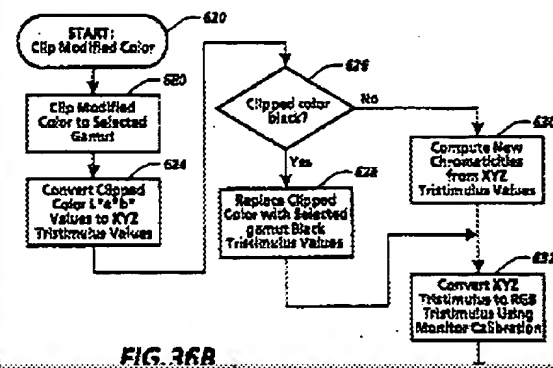
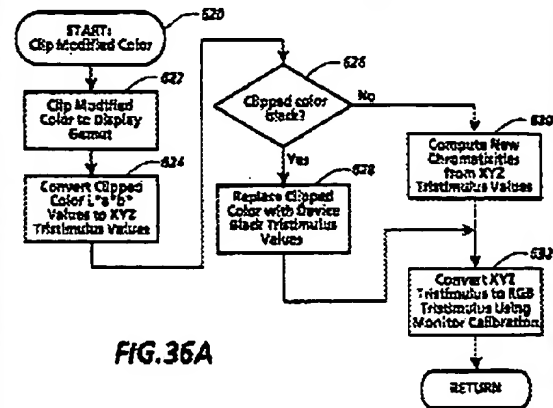
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Detailed Description Text - DETX (173):

The clipping procedure in box 622 involves accessing the 19 by 40 fineGamut array containing the monitor gamut a^* , b^* values to find the maximum chroma for the modified color's L^* value. If the maximum chroma is greater than the modified color's chroma, the modified color's chroma is replaced by the maximum chroma, and the cylindrical coordinates of the color are converted back to LAB color space a^* , b^* coordinates. The Cedar language code in Table 14 below illustrates this processing. Those skilled in the art will recognize that, while color editing GUI 10 takes advantage of the perceptual uniformity of CIELAB color space to perform color editing functions, another suitable clipping algorithm may be used to change the user's color modifications to place the modified color in the monitor's color gamut.



US-PAT-NO: 6038340

DOCUMENT-IDENTIFIER: US 6038340 A

TITLE: System and method for detecting the black and white
points of a color image

----- KWIC -----

Abstract Text - ABTX (1):

A system for detecting image black and white points for a digital image. The system includes image partitioning routines for partitioning a digital image into image blocks, a pixel counter for determining whether the image block contains sufficient black and white pixels to classify the block as having relatively black text on a relatively white background, block validity testing routines for determining whether the selected image block is valid by determining whether the number of relatively black pixels for the selected image block is greater than a predetermined black threshold and whether the number of relatively white pixels for the selected image block is greater than a predetermined white threshold, and pixel clustering routines for arranging the relatively black pixels of a valid block into black clusters and the relatively white pixels of a valid block into white clusters and for assigning one of the black cluster centroids based on a first predetermined set of rules as the image black point and one of the white cluster centroids based on a second predetermined set of rules as the image white point.

US Patent No. - PN (1):

6038340

US Document Identifier - DID (1):

US 6038340 A

Brief Summary Text - BSTX (12):

The image partitioning routines partition a digital image into image blocks, and a pixel counter counts the relatively black pixels and the relatively white pixels in a selected image block to determine whether the image block contains a sufficient number of black and white pixels to classify the block as having

relatively black text on a relatively white background. The block validity testing routines determine whether the selected image block is valid by determining whether the number of relatively black pixels for the selected image block is greater than a predetermined black threshold and whether the number of relatively white pixels for the selected image block is greater than a predetermined white threshold. The pixel clustering routines arrange the relatively black pixels of a valid block into black clusters and the relatively white pixels of a valid block into white clusters, and assign a black cluster centroid as the image black point and a white cluster centroid as the image white point.

Brief Summary Text - BSTX (15):

The invention also provides a method for detecting image black and white points for a digital image. The method includes the steps of partitioning the digital image into image blocks, determining whether the block is valid by determining whether the number of relatively black pixels in the block is greater than a predetermined black threshold and whether the number of relatively white pixels in the block is greater than a predetermined white threshold, arranging the relatively black pixels into black clusters and the relatively white pixels into white clusters for each valid block and assigning the centroid of one of the black clusters and the centroid of one of the white clusters as the black and white points, respectively.

Detailed Description Text - DETX (20):

Pixel clustering routines 340 in step 530 test whether all the pixels have been tested. If so, then method 450 ends. If not, then in step 540 pixel clustering routines 340 select an untested pixel and in step 550 compares the selected pixel's RGB values with the centroids' RGB values of the "current" (i.e., as currently established) clusters. Pixel clustering routines 340 in step 560 determine whether the selected pixel resides within a predetermined "distance" (dR, dG, dB) of a cluster centroid to determine whether it belongs to that cluster. Step 560 may be implemented using absolute values, Euclidean distances, etc. If the pixel does not belong to any of the clusters, then in step 570 pixel clustering routines 340 set the RGB values of the selected pixel to be the centroid of a new cluster, and return to step 530.

Detailed Description Text - DETX (21):

If the selected pixel is within the predetermined distance of a cluster centroid, then in step 580 pixel clustering routines 340 assign the selected pixel to be a member of the cluster, increments by one the number of pixels in that cluster, and computes the new cluster centroid. Pixel clustering routines

340 in step 590 preferably apply the following centroid averaging equations:

Detailed Description Text - DETX (23):

FIG. 6 is a flowchart illustrating steps in the FIG. 4 operation 470, which begins in step 610 with pixel clustering routines 340 determining the black cluster having the most black pixels. Pixel clustering routines 340 preferably disregard as noise all black clusters having less than a **predetermined** minimum pixel count, such as 20,000 pixels. The minimum pixel count varies depending on the scan resolution. If multiple clusters are identified, then in step 620 pixel clustering routines 340 compare the clusters' centroid RGB values to select the darkest of the clusters as the black cluster. Pixel clustering routines 340 in step 630 round the centroid RGB values of the selected black cluster to the nearest integer, and assign this centroid value of the black cluster to be the black point. Method 470 then ends.

Detailed Description Text - DETX (24):

FIG. 7 is a flowchart illustrating steps in the FIG. 4 operation 480, which begins in step 710 with pixel clustering routines 340 determining the white cluster having the most white pixels. Pixel clustering routines 340 preferably disregard as noise all white clusters having less than a **predetermined** minimum pixel count, such as 50,000 pixels. This minimum pixel count also varies depending on the scan resolution. If multiple clusters are identified, then in step 720 pixel clustering routines 340 compare the clusters' centroid RGB values to select the lightest of the clusters as the white cluster. Pixel clustering routines 340 in step 730 round the centroid RGB values of the selected white cluster to the nearest integer, and assign this centroid value of the white cluster to be the white point. Method 480 then ends.

Detailed Description Text - DETX (25):

Where the total number of black/white pixels in all valid blocks is denoted by K , the number of clusters is denoted by M (initially 0), the RGB values for the k .sup.th pixel are denoted by $(R_{\text{sub}.k}, G_{\text{sub}.k}, B_{\text{sub}.k})$, the **predetermined** maximum RGB distance for a pixel to be a member of a particular cluster is denoted by $d_{\text{sub}.R}, d_{\text{sub}.G}$ and $d_{\text{sub}.B}$, the centroid of the m .sup.th cluster is denoted by $(C_{\text{sub}.m.\text{sup}.R}, C_{\text{sub}.m.\text{sup}.G}, C_{\text{sub}.m.\text{sup}.B})$ and the number of pixels in the m .sup.th cluster is denoted by $N_{\text{sub}.m}$, the pixel clustering algorithms may be written in "pseudo-code" as follows:

Detailed Description Paragraph Table - DETL (1):

C.sub.0 .sup.R = R.sub.0 ;

C.sub.0
 .sup.G = G.sub.0 ; C.sub.0 .sup.B = B.sub.0 ; ***first centroid is set to
 first black/white pixel*** M = 1; ***set number of current black/white
 clusters*** for (k = 1; k < K; k++) [***for each black/white pixel***
 part-of-an-old-cluster = No; for (m = 0; m < M; m++) [***for each
 black/white cluster*** if .vertline.R.sub.k - C.sub.m .sup.R .vertline. <
 d.sub.R ***are pixel RGB values .vertline.G.sub.k - C.sub.m .sup.G .vertline.
 < d.sub.G within predetermined .vertline.B.sub.k - C.sub.m .sup.B
 .vertline. < d.sub.B distance of a cluster centroid*** then C.sub.m
 .sup.R = [(N.sub.m * C.sub.m .sup.R) + R.sub.k] / ***compute new centroids***
 (N.sub.m + 1); C.sub.m .sup.G = [(N.sub.m * C.sub.m .sup.G) + G.sub.k] /
 (N.sub.m + 1); C.sub.m .sup.B = [(N.sub.m * C.sub.m .sup.B) + B.sub.k] /
 (N.sub.m + 1); N.sub.m = N.sub.m + 1; part-of-an-old-cluster = Yes;]
 end if] ***end for m*** if (part-of-an-old-cluster = No) [***new
 cluster*** then C.sub.M .sup.R = R.sub.k ; C.sub.M .sup.G = G.sub.k ; C.sub.M
 .sup.B = B.sub.k ; ***new cluster's centroid set N.sub.M = 1; M++; to pixel
 RGB values***] ***end if***] ***end for k*** max = min-number-of-pixels;
 minimum number of pixels for a cluster to be valid for (m = 0; m <
 M; m++) [***for each black/white cluster*** if (N.sub.m > max) [***no
 noise*** then P.sub.R = (C.sub.m .sup.R + .5); *** black/white point equals
 P.sub.G = (C.sub.m .sup.G + .5); centroid of black/white cluster P.sub.B =
 (C.sub.m .sup.B + .5); having most member pixels max = N.sub.m ; rounded off
 to nearest integer***]

Claims Text - CLTX (3):

classifying each of the image blocks as valid if a given image block has a total number of relatively black pixels exceeding a first predetermined threshold and a total number of relatively white pixels exceeding a second predetermined threshold, wherein a relatively black pixel is defined as a pixel whose color component values are each less than a predetermined black pixel threshold and a relatively white pixel is defined as a pixel whose color component values are each greater than a predetermined white pixel threshold;

Claims Text - CLTX (5):

selecting one of the black cluster centroids according to a first predetermined set of rules to be a black point of the digital image and one of the white cluster centroids according to a second predetermined set of rules to be a white point of the digital image.

Claims Text - CLTX (7):

3. The method of claim 1, wherein a relatively black pixel is defined as a pixel whose RGB values are each less than the **predetermined** black pixel threshold and a relatively white pixel is defined as a pixel whose RGB values are each greater than the **predetermined** white pixel threshold.

Claims Text - CLTX (14):

determining whether each of the image blocks is valid, by determining whether a total number of relatively black pixels in a given image block is greater than a first **predetermined** threshold and whether a total number of relatively white pixels in the given image block is greater than a second **predetermined** threshold, wherein a relatively black pixel is defined as a pixel whose color component values are each less than a **predetermined** black pixel threshold and a relatively white pixel is defined as a pixel whose color component values are each greater than a **predetermined** white pixel threshold;

Claims Text - CLTX (16):

selecting one of the black cluster centroids based on a first **predetermined** set of rules as the black point and one of the white cluster centroids based on a second **predetermined** set of rules as the white point of the digital image.

Claims Text - CLTX (18):

9. The method of claim 7, wherein a relatively black pixel is defined as a pixel whose RGB values are each less than the **predetermined** black pixel threshold and a relatively white pixel is defined as a pixel whose RGB values are each greater than the **predetermined** white pixel threshold.

Claims Text - CLTX (25):

means for determining whether each of the image blocks is valid, by determining whether a total number of relatively black pixels in a given image block is greater than a first **predetermined** threshold and whether a total number of relatively white pixels in the given image block is greater than a second **predetermined** threshold, wherein a relatively black pixel is defined as a pixel whose color component values are each less than a **predetermined** black pixel threshold and a relatively white pixel is defined as a pixel whose color component values are each greater than a **predetermined** white pixel threshold;

and

US-PAT-NO: 5537491

DOCUMENT-IDENTIFIER: US 5537491 A

TITLE: Analyzing an image or other data to obtain a stable
number of groups

----- KWIC -----

Abstract Text - ABTX (1):

To group items in an array, gap data are obtained indicating gaps between items. The gap data are used to obtain threshold data, which are then used to obtain grouping data. The gaps could, for example, be distances between items in a two-dimensional array or differences between values at which items occur in a one-dimensional array. The threshold data indicate a threshold. The threshold would produce a number of groups of the items that is stable across a range of thresholds, and the range of thresholds meets a criterion for largeness of a range. The criterion can require, for example, that the range be larger than the stable range of thresholds of any other number in a set of numbers of groups. The threshold can be obtained iteratively by applying a candidate threshold for each iteration. The candidate thresholds can be incremented, and the iterations can be counted to find a number of groups meeting the criterion. Or the candidate thresholds can be increased by differences between gaps, and a running sum of threshold ranges can be used to find a number of groups meeting the criterion. The threshold can also be obtained directly by finding the largest difference between gap extents and obtaining a threshold within the largest difference. Many types of grouping can be performed, including spatial clustering, segmentation of partially bounded regions, segmentation by local width, and global and local similarity grouping.

Brief Summary Text - BSTX (18):

To group parts of an image, as in clustering or segmentation, the technique can obtain the gap data from data defining the image. For example, the gap data can indicate, for each pixel, a distance to a black pixel that is a near neighbor of the pixel. The threshold can be compared with each pixel's distance to obtain a thresholded version of the image; each pixel with a

distance above the threshold can be ON, or, alternatively, each pixel with a distance below the threshold can be ON. The technique can obtain the grouping data by labeling each pixel in a part of the image with a unique identifier of the group in the thresholded version that includes the part.

Detailed Description Text - DETX (25):

An "image" is a pattern of physical light. An "image set" is a set of one or more images.

Detailed Description Text - DETX (26):

When an image is a pattern of physical light in the visible portion of the electromagnetic spectrum, the image can produce human perceptions. The term "graphical feature", or "feature", refers to any human perception produced by, or that could be produced by, an image.

Detailed Description Text - DETX (62):

A "threshold" is a function that can be used to distinguish a number of items into two sets, one set "above" the threshold, and the other set "below" the threshold. A threshold can be a function of position or context within an array of items, or can have the same value for every position and context in the array. The value of a threshold that has the same value for every position and context is typically indicated by indicating either the lowest of the values above the threshold or the highest of the values below the threshold.

Detailed Description Text - DETX (63):

A "gap" between items in an array is a portion of the array that extends between the items and does not include any other items that meet an appropriate criterion. For example, in an array of binary items such as a binary image, a gap could extend between two ON items that are separated by OFF items or between two OFF items that are separated by ON items. More generally, in an array of n-ary items, a gap could extend between items above a threshold that are separated by items below the threshold or vice versa. In principle, an array within which gaps occur is equivalent to a variety of data structures—for each item, a value could be indicated; items with each value could be listed; in a binary array, items with one value could be listed, implicitly indicating that all other items have the other value; a hash table or other data structure could indicate each item's value when accessed with the

item's position in the array; or a mathematical function of position could provide each item's value. In practice, however, it is advantageous to define an array in a manner that facilitates computation to obtain data indicating information about a gap between items.

Detailed Description Text - DETX (72):

An item of data "defines" a number of groups of items in an array if the item of data includes information indicating the number of groups and, for each group, the items it includes. For example, if a first array includes an item for each item in a second array, the first array can define a number of groups of items in the second array in several ways: Each item in the first array can be ON if a distance for its item in the first array is above a threshold or, alternatively below a threshold; in this case, the first array defines groups of adjacent items, which can be counted to obtain the number of groups. Or an item in the first array can include a group identifier identifying a group that includes its item in the second array; in this case, the first array defines groups of items that have the same group identifier and the group identifiers can be counted to obtain the number of groups. If the second array defines an image, the first array can define a version of the image in which the groups cluster connected components or segment the image.

Detailed Description Text - DETX (169):

The techniques described above can be used to perform several different types of grouping, including clustering, segmentation of images, and similarity grouping. FIGS. 12-15 illustrate several types of grouping that have been implemented using techniques described above. FIGS. 12-14 illustrate proximity grouping of three types--spatial clustering, segmentation of partially bounded regions, and segmentation by local width. FIG. 15 illustrates global similarity grouping.

Detailed Description Text - DETX (198):

Gap data can be obtained by performing project operations on the array to obtain a filled array, shifting the filled array, and taking a difference between the filled array and the shifted filled array, as described above, to obtain a list of differences or to obtain another array indicating, for each difference, whether it occurs. The gap data can be used to obtain a threshold as described above, by finding the largest difference between gap extents. The threshold can then be compared with the differences between non-zero values in the array to obtain grouping data indicating equivalence classes of the values of area. Each equivalence class can be given a unique identifier, and grouped image 432 can be obtained in which each pixel with a non-zero value in the area

data image is labeled with the unique identifier of the equivalence class that includes the value. The difference identifiers are represented in grouped image 432 by different patterns of grey.

Detailed Description Text - DETX (202):

The implementations described above apply a single-valued threshold to a distance for each item in an array. The implementations might be modified to apply a threshold that is a function that can assume different values at different positions in an array, such as a function of position or of context. For example, a threshold at a given position could be a function of a near neighbor's distance to its near neighbor or of any other value with which the position can be labeled.

Detailed Description Text - DETX (207):

The implementations described above operate on binary images, but could be extended to operate on color or gray scale images, either directly or after binarization.

groups of related objects as a function

of the proximity of the objects to each other and as a function of the boundary data; and

leg 3 **means for supplying data relating to the groups of objects for subsequent analysis.**

9. A method for processing images

for producing clusters of related objects within an image for subsequent analysis , said method including the steps of; supplying a multi-level digital representation of an image; identifying predetermined objects in the image; and supplying data defining the locations of the predetermined objects based on the multi-level digital representation of the image; deriving boundary data from the multi-level digital representation of the image, the boundary data representing boundaries between regions of the original image having different characteristics; and clustering the predetermined objects into groups of related objects as a function of the proximity of the objects to each other and a function of the boundary data.

17. The image processing system of Claim 1, wherein said means for deriving boundary data derives boundary data based on a representation

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